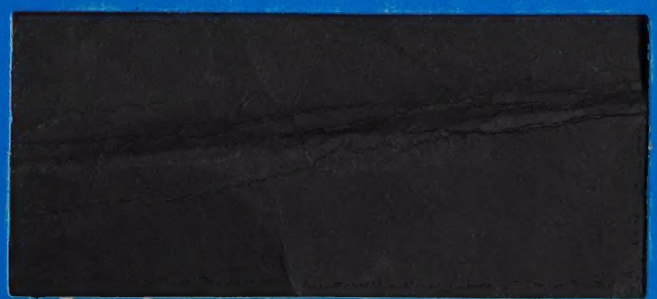

tau-tron

A UNIT OF
GENERAL SIGNAL

ME-302
PART NO. 8200-0083

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GENERAL SIGNAL

ME-302

DATA RATE EXTENDER

OPERATION MANUAL
FORM 0202-1182C

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(617) 692-5100 Telex 750245 1-800-TAU-TRON (Outside MA)

WARRANTY

All Tau-tron products are warranted against any defects in material and workmanship. This warranty applies for one year from the date of delivery for all Tau-tron manufactured products. The warranty period for OEM products sold by Tau-tron will depend on the original OEM warranty (consult factory for specific products). We will repair or replace products which, upon our examination, prove to be defective during the warranty period.

NO OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING FITNESS FOR PURPOSE, MERCHANTABILITY OR OTHERWISE, IS GIVEN.

For assistance, contact Customer Service with details of the instrument model, serial numbers, and malfunction; see Repair Returns below.

SHIPPING DAMAGE

If any signs of damage are noted on the outside of the carton, request that the carrier's agent be present during unpacking. If external damage is found on the instrument, follow Repair Returns procedure below.

Check the electrical performance of the instrument as soon as possible after receipt. If any malfunctions are observed, follow Repair Returns procedure below.

REPAIR RETURNS

For mechanical damage or electrical malfunctions, notify Tau-tron immediately. If the damage occurred during shipping, also notify the carrier. To return a unit for repair:

1. Call the Customer Service Department, (617) 692-5100, for a Repair Authorization Number. This will reduce administrative delays and ensure prompt return of your unit.

2. Complete and attach the Repair Tag, in the rear of the manual, to your unit for positive identification.

3. Pack the unit in the original shipping carton and packing materials, if available. Otherwise use a double-walled carton (test strength of 350 lb; 159 kg) and shock-absorbing material such as bubblewrap to prevent the unit from moving in the carton during transit. Secure the carton by sealing with heavy paper tape.

4. Send to: Tau-tron Inc.
   10 Lyberty Way
   Westford, MA 01886
   Attn: Customer Service

The ME-302 Data Rate Extender Operations Manual is provided in modular form so that it can be tailored to your particular system.

The manual for this module is complete in itself and contains information required to install and operate the module.

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3. ME-302 DATA RATE EXTENDER

3.1 DESCRIPTION

The ME-302 Data Rate Extender is a quarter-size TMI module that is used as a companion unit to the MN/MB-302 325Mb/s BERTS SYSTEM. The ME-302 extends the upper frequency of the BERT set to 650Mb/s. The unit contains two major sections; the MULTIPLIER section which provides high-frequency output data, and the DIVIDER section which samples the high-speed input data and provides the low-speed output of the receiver signal to drive the MB-302 receiver.

3.2 SPECIFICATIONS

Multiplier Clock Input	200 to 650MHz sinewave, 1V pk-to-pk into 50 ohms to ground at front-panel BNC connector.
Divider Clock Input	200 to 650MHz sinewave, 1V into 50 ohms to ground or ECL level into 50 ohms to -2V at front-panel BNC connector.
Divider Data Input	200 to 650Mb/s NRZ format, 1V into 50 ohms to ground or ECL level into 50 ohms to -2V at front-panel BNC connector.
Multiplier Clock Output	At the Multiplier Clock Input frequency of 200 to 650MHz, 1V into 50 ohms to ground or ECL level into 50 ohms to -2V at front-panel BNC connectors.
Multiplier Data Output	At the Multiplier Clock Input frequency of 200 to 650Mb/s, NRZ format of 1V into 50 ohms to ground or ECL level into 50 ohms to -2V at front-panel BNC connector.
MN-302 Interface	Clock input to MN-302 is squarewave at half the frequency of the Multiplier Clock Input, at ECL level into 50 ohms to -2V. Data output from MN-302 is NRZ format at special dual input/output connector.
MB-302 Interface	Clock output and both data phases are provided. Clock output to MB-302 is squarewave at half the frequency of the Multiplier or Divider Clock Input, at ECL level into 50 ohms to -2V. Data output to MB-302 is NRZ format, at ECL level into 50 ohms to -2V at special dual output connectors.
Special Purpose Interface	Front-panel interconnecting cables (supplied) to connect the ME-302 to the MN and MB-302.
Power	+34V at .2A, +17V nominal at 0.65A, -17V nominal at 3.2A, unregulated and supplied by mainframe.
Cooling	Forced air, supplied by mainframe.
Mechanical	TMI quarter-size module. DIMENSIONS: 6.375 in. high x 4 in. wide x 11 in. deep. WEIGHT: 3 lb net, 5 lb shipping.

3.3 INSTALLATION

The ME-302 must always be installed on the right adjacent to the MN-302 when it is being used in it's normal configuration as part of the BERTS-650.

Module Insertion

1. Pull out the Mainframe Module Lock knob.
2. Insert the module.
3. Push in the Module Lock knob.

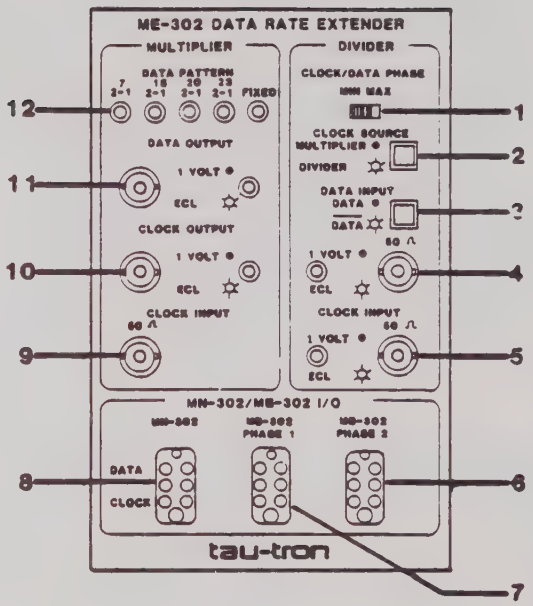
Module Removal

1. Pull out the Mainframe Module Lock knob.
2. Grasp the module to be removed by its front-panel thumbscrews and pull to remove.
3. Push in the Module Lock knob to prevent the remaining modules from accidentally falling out.

Interconnections

Attach the special purpose front-panel interconnecting cables to the connector blocks on the ME-302, then connect the BNC end to the appropriate jacks on the MN and MB-302.

3.4 FRONT PANEL



1 CLOCK/DATA PHASE — Two-position horizontal slide switch to compensate for time coincidence at the Data Sampler latch.

2 CLOCK SOURCE — Illuminated pushbutton selects the demultiplexing clock. The de-energized position (LED OFF and pushbutton out) selects the MULTIPLIER CLOCK input, the energized position (LED ON and pushbutton in) selects the DIVIDER CLOCK as the demultiplexing clock.

3 DATA INPUT Select — Illuminated pushbutton controls the polarity of the output data to the MB-302. The de-energized position provides TRUE data outputs, the energized position (LED ON and pushbutton in) provides complemented data at the MB-302 I/O interfaces.

4 DATA INPUT — BNC connector with LED for high-speed data input. A switch on the printed-circuit board determines the input termination either 1V into 50 ohms to ground or 50 ohms to -2V (ECL).

5 CLOCK INPUT — BNC connector with LED for applying a full-rate clock signal input if the DIVIDER clock source has been selected as the demultiplexing clock. A switch on the printed-circuit board allows selection between 50 ohms to ground or 50 ohms to -2V (ECL). The signal amplitude should be .8V to 1V peak-to-peak.

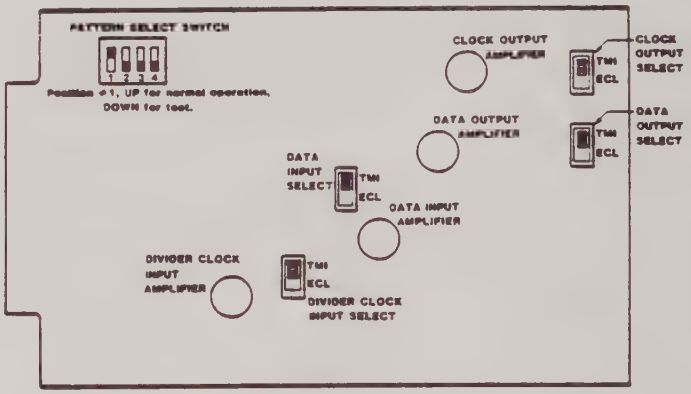
6 MB-302 PHASE 2 DATA/CLOCK — Connector block carrys the 1/2 rate demultiplexed data and its properly phased clock to the MB-302 for bit error-rate testing.

7	MB-302 PHASE 1 DATA/CLOCK	Connector block carrys the 1/2 rate demultiplexed data and its properly phased clock to the MB-302 for bit error-rate testing.
8	MN-302 DATA/CLOCK	Connector block provides the signal path for the 1/2 rate clock to the MN-302 and the 1/2 rate data stream from the MN-302 to the ME-302.
9	CLOCK INPUT	BNC connector for a sinewave signal of 1V peak-to-peak amplitude which is required to drive the ME-302. The input impedance is 50 ohms to ground.
10	CLOCK OUTPUT	BNC connector with LED for an output signal equal to the input clock frequency. The signal is either 1V into 50 ohms to ground (LED not lit). At the highest frequencies this amplitude may drop to 750mV peak-to-peak.
11	DATA OUTPUT	BNC connector with LED for a signal at twice the rate generated by the MN-302 or, in other words, at a rate equal to the multiplier clock input. An internal switch on the ME-302 board allows selection between 1V into 50 ohms to ground (LED not lit) or ECL with 50 ohms to -2V (LED lit).
12	DATA PATTERN	Five LEDs indicate the data pattern selected by the MN-302 and track the MN-302 pattern selection via an optical coupler interface between the two modules. The data pattern LEDs 2^7-1, 2^{15}-1, 2^{20}-1, and 2^{23}-1 are yellow indicating a normal mode of operation. The fixed pattern LED is red and indicates that the MN-302 is not in the pseudorandom mode. FIXED pattern selection on the MN-302 is NOT defined when using the ME-302 in the BERTS-650 configuration.

3.5 OPERATION

3.5.1 INPUT/OUTPUT LEVEL SELECT

Before turning on power, pull out the PULL TO UNLOCK lever at the upper right-hand corner of the mainframe, slide the ME-302 out and set the internal printed-circuit board slide switches for the desired output levels.



Check the position of the PATTERN SELECT switch in the upper left-hand corner of the circuit board; position one must be in the UP postion for normal operation.

3.5.2 CONNECTIONS

The special coaxial connector block cable assembly must be used to interconnect the ME-302 to its companion modules, the MN and ME-302. As shown on the front panel, the uppermost cable of the pair must be connected to the DATA of the appropriate module while the lower cable must be connected to the CLOCK.

All other connections to and from the system under test must be made using a 50-ohm coaxial cable with BNC connectors.

3.5.3 PATTERN SELECTION--OPTICAL COUPLER

The patterns are selected on the MN-302 front panel, the ME-302 tracks the MN-302 by way of an optical coupler mounted at the inside edge of each module. This coupler transforms the DC control signal on the MN-302 into infrared light with infrared optical transmitters. A matched set of optical receivers in the ME-302 converts these signals into control voltages which are decoded into the code select logic.

3.6 THEORY OF OPERATION

3.6.1 INTRODUCTION

The ME-302 Data Rate Extender is composed of two sections, the Multiplier and Divider. In the Multiplier section, an input clock at the desired rate is required. This clock is internally halved to produce a clock output which will drive the MN-302 BERT Transmitter. Pseudorandom data are returned to the ME-302 which doubles the data rate. NRZ data at the double data rate and clock are provided as outputs to the system under test. The ME-302 data pattern selection is automatically matched to the MN-302 data pattern to reproduce the same pseudorandom sequence at twice the MN-302 data rate.

The Divider section receives the NRZ data from the system under test, the data are sampled by a two-phase half-rate clock to produce the half-rate data for the MB-302. Both phases of the sampled data and sampling clock are available. Either the divider input clock (a clock generated by the system under test) or the multiplier clock may be used to sample the data. A phase adjustment control provides for proper sample clock/data alignment at any particular frequency.

3.6.2 MULTIPLIER SECTION

The data rate multiplier principle used in the ME-302 is a well known technique for generating high-speed pseudorandom data patterns. If a pseudorandom sequence is multiplexed with a delayed version of itself, and if the delay is one half of a code frame, then the result will be a sequence which is identical to the input in terms of the distribution of ones and zeros, but the data rate will be twice that of the input. This function is accomplished in four stages in the ME-302, a code phase shifter, a code multiplexer (Exclusive-OR), a times two multiplier and an output latch.

The half-frame delay function takes advantage of a property of pseudorandom sequences and Exclusive-OR circuits; if the inputs to an Exclusive-OR are a pseudorandom sequence and the same sequence but delayed by a few bits, then the output will be the same as the input, but will have a different frame phase relationship. If this delay is chosen properly, then this phase-shifted output, when referenced against the original sequence, will be displaced by one-half of a code frame. (A frame is defined as one complete sequence of the code.)

The half-rate data pattern is generated by the MN-302. The ME-302 clock input, at full rate, is applied to a divide-by-two circuit and sent to the MN-302 clock input via one of the special front-panel connecting cables. The data output of the MN-302 is returned to the ME-302 on the other cable of that pair. This half-rate pattern is applied to the MN-302 Code Phase Shifter which is a special hybrid micro-circuit. The phase relationship at the Code Phase Shifter outputs is such that the code multiplexer can produce the two half-rate sequences which have a phase difference of one half of a code frame. The combination of these two circuit elements will maintain this half-frame phase relationship for all four pseudorandom patterns generated by the MN-302 over the entire frequency range of the system.

These two half-rate sequences become inputs to the times-two multiplier along with the true and complement half-rate clock. The multiplier samples each sequence on alternating half cycles to produce a pair of RZ sequences whose bit width is now one half of the input. This RZ signal is now at a bit rate which is twice that of the input.

The output latch combines these two RZ bit streams at its OR input and latches the full-rate clock, the output is now the same data pattern as the MN-302 but is running at twice the rate.

3.6.2.1 FIXED PATTERNS

Fixed patterns are not defined because there is no convenient method to find a correct phase relationship between the pattern and a delayed version of itself such that the result of the rate multiplying process would yield the exact input at twice the rate. It is for this reason that the red LED indicator is used as a caution that this mode has been selected on the MN-302. The output of the ME-302 is not predictable under these circumstances and the system must not be used in this mode.

3.6.3 INPUT/OUTPUT AMPLIFIERS

The input/output amplifiers are high-speed switching circuits and are constructed by using hybrid circuit techniques in modular packages. These amplifiers are capable of fast transition times and minimum waveshape distortion when driving 50-ohm DC coupled loads. The 1 volt/ECL level setting, which is selected by a front-panel switch, changes bias voltages on these amplifiers such that the terminating voltage potential can be either ground or -2 volts.

3.6.4 DIVIDER SECTION

The Divider section of the ME-302 consists of a Sample Clock Selector which allows a choice between the Multiplier clock or a clock from the system under test to be used as the demultiplexing clock. The Data Sampler accepts the full-rate data input from the system under test and generates two data outputs, each at half rate, for use by the MB-302 BERT Receiver.

3.6.4.1 SAMPLE CLOCK SELECT

The sample clock is a true and complement half-rate clock, this clock can be derived from either the Multiplier input clock or the Divider input clock and is the latching clock applied to the Data Sampler. If the system under test generates its own clock by some means of clock recovery or if it simply transmits a clock with the data on two wires, then the Divider Clock should be used. If no recovered clock is available, then the Multiplier Clock must be selected. The select mechanism is equivalent to a single-pole double-throw switch which allows a simple choice between the Divider and Multiplier Clocks.

3.6.4.2 DATA SAMPLER

The Data Sampler is a pair of high-speed "D" flip-flops which accept the full rate NRZ input data stream on a common input and the true/complement half-rate sample clock on each of two clock inputs. The output of the sampler is a pair of half-rate sequences which are designated Phase 1 and Phase 2 data, a half-rate clock of identical phase relationship is also generated and sent to the MB-302. These signals are driven from standard ECL circuits, the pull-down resistor for these signals is contained inside the MB-302; hence, the MB-302 CLOCK and DATA inputs must be in the ECL mode for proper operation.

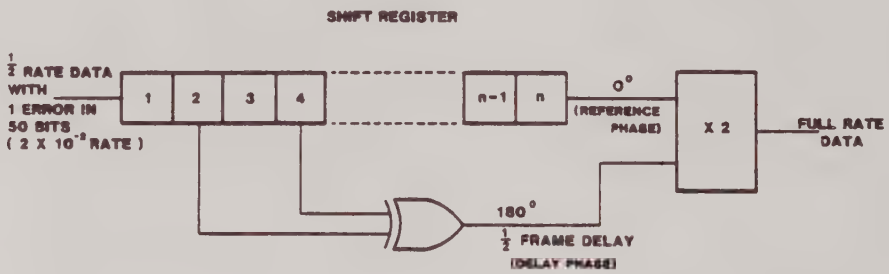
3.6.4.3 CLOCK/DATA PHASE CONTROL

The purpose of this control is to keep the clock and data phase relationship at the Data Sampler input from violating the set-up time of these "D" flip-flops. The phase control itself is a double-pole, double-throw RF relay where one set of contacts is a short-circuit path while the other set runs through a length of coaxial cable providing approximately 0.7ns delay. This adjustment is critical at the higher data rates, especially when the phase relationship at the input can be arbitrary at any specific frequency.

3.6.5 BACK-TO-BACK ERROR INJECT OPERATION

When the Internal Error Inject function is selected, the MN-302 generates one error in 50 bits which translates to two errors in 100 bits or an error-rate of 2×10^{-2} when observed on the MB-302 Error Counter. When the ME-302 accepts the MN-302 half-rate data input, it must provide a delayed version of this half-rate sequence in order to perform the rate multiplying function (see Section 3.6.2).

The following block diagram of the ME-302 operating under error inject conditions illustrates why the MB-302 can read either 2×10^{-2} or 4×10^{-2} error-rates in a back-to-back operation.

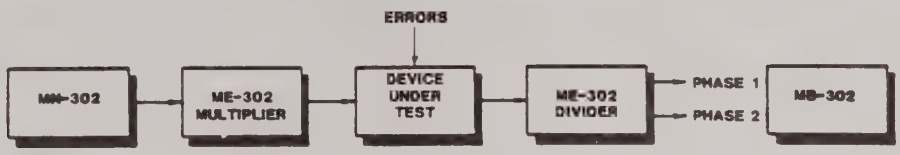


The half-rate data, with errors inserted, enter the shift register and pass directly through to provide the REFERENCE PHASE input to the x2 multiplier. In order to generate the DELAY PHASE, two stages of the shift register are made inputs to the Exclusive-OR. Each of these Exclusive-OR inputs have the injected error-rate of 2×10^{-2}. Thus, the output of the DELAY PHASE will be the same pseudorandom sequence as the input but it now contains 4×10^{-2} errors.

When this signal becomes multiplied to the full data rate and is applied to the ME-302 Divider input, the Data Sampler (see Section 3.6.4.2) will demultiplex the single full-rate data stream into the half-rate Phase 1 and Phase 2 outputs. One of these phases, and the choice is arbitrary only depending on which phase of the Sampler clock strobes the input latch first, will demultiplex into the equivalent of the multiplier REFERENCE PHASE which had a 2×10^{-2} error-rate and the other will demultiplex into the DELAY PHASE which contains a 4×10^{-2} error-rate.

3.6.6 ACTUAL ERROR CONDITIONS

In systems applications, a typical block diagram would be as follows:



In this situation, the errors occur in the system under test at the full data rate and; hence, when sampled in the ME-302 Divider, have equal probability of being present in either the Phase 1 or Phase 2 output.

3.6.7 DATA/$\overline{\text{DATA}}$ SELECT

If the system under test happens to provide inverted data at the output, then the $\overline{\text{DATA}}$ selection will provide true data signals at the Phase 1 and Phase 2 outputs. This selection merely provides a DC level to an Exclusive-OR which results in a data inversion at the output.

3.6.8 MODULE POWER SUPPLIES

The ME-302 uses the +34V and ±17V unregulated mainframe voltages to generate the module DC voltages. The +34V is applied to a 15V 3-terminal regulator mounted on the main PC board, this voltage is used to run the broad-band RF amplifiers at the Multiplier Clock input. The +17V input drives a +8V 3-terminal regulator on the rear panel of the module, this voltage is used on the high-speed input/output amplifiers and also to drive a +5V regulator which supplies a small amount of current to some TTL circuits and bias voltages. The -17V input drives a rear-panel mounted 3-terminal -5.2V regulator and a side-panel mounted boost transister to handle the 3.2A required by the module. The -2V termination potential for the ECL circuits is developed from an additional 3-terminal regulator on the main PC board which is driven from the -5.2V input.

3.6.9 GPIB

The ME-302 does not have direct input from the GPIB bus, the only functions which are under any automatic control are the DATA PATTERN select lines. These are always slaved to the MN-302 by means of the optical coupler (see Section 3.5.3).

3.7 SERVICE

DANGER: Hazardous voltages exist in this equipment. Do not attempt access to the interior without first disconnecting the line cord from the power receptacle to the MF-5 Mainframe.

3.7.1 ROUTINE SERVICE

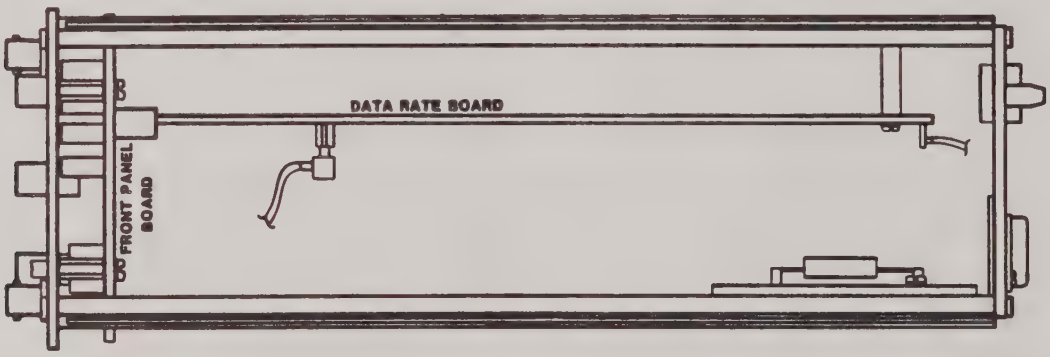
Routine service includes the performance of checks and service procedures which prevent or minimize the downtime of the unit. The checks and service are simplified, and may be limited to visual inspection for defective components, loose hardware and/or accumulation of dust within the unit at critical areas.

NOTE: It is recommended that periodic cleaning (approximately once every three months) of the interior and exterior of the unit be done with a vacuum cleaner.

Refer to Section 3.3, INSTALLATION, for module removal.

Board Seating

Ensure that all printed cicuit boards are securely seated in their connectors as shown in the illustration below.



ME-302

3.7.2 REPAIR RETURNS

For mechanical damage or electrical malfunctions, refer to Page ii, REPAIR RETURNS.

3.7.3 ASSISTANCE

For service assistance call the Tau-Tron Customer Service Dept., (617) 692-5100. Their experience and expertise can often save you valuable time in correcting any equipment malfunction.

3.7.4 TROUBLE ANALYSIS

DANGER: Hazardous voltages exist in this equipment. Do not attempt access to the interior without first disconnecting the line cord from the power receptacle to the MF-5 Mainframe.

Input/Output Levels

Verify that selected input/output levels are correct by observing the front panel; 1V DATA and CLOCK inputs (LEDs not lit), ECL DATA and CLOCK inputs (LEDs lit), 1V DATA and CLOCK outputs (LEDs not lit), and ECL DATA and CLOCK outputs (LEDs lit). Refer to Section 3.5.1 INPUT/OUTPUT LEVEL SELECT, for proper 1V/ECL settings.

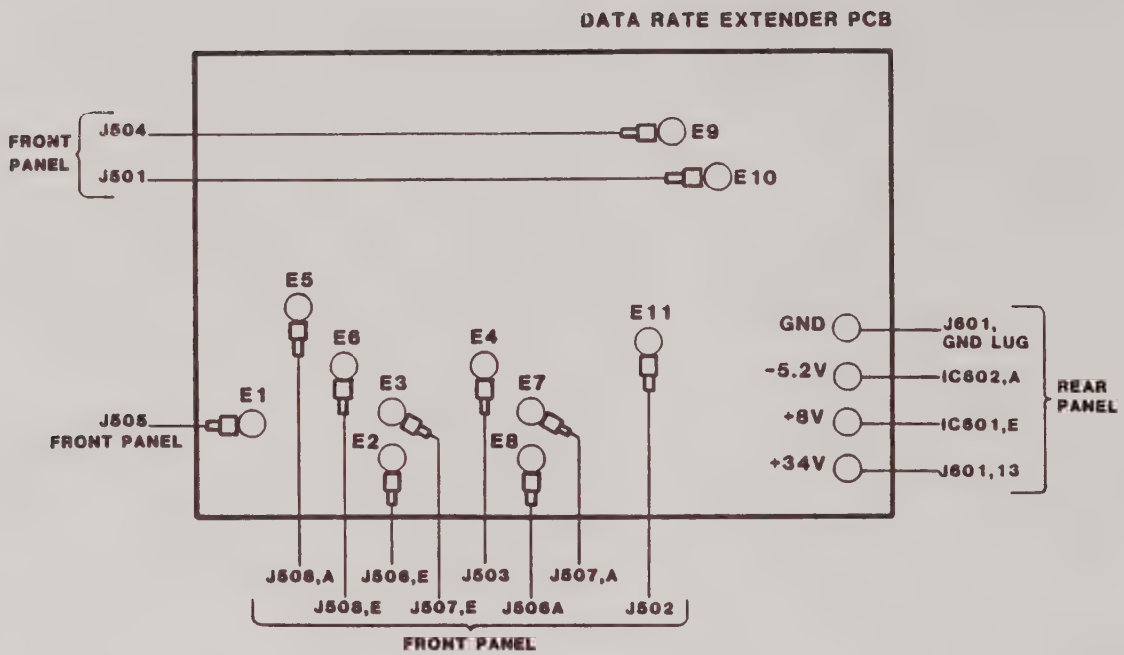
Pattern Select

Verify that PATTERN SELECT SWITCH in the upper left-hand corner of the INPUT/OUTPUT LEVEL SELECT board is correct; position #1 should be UP for normal operation. Refer to Section 3.5.1, INPUT/OUTPUT LEVEL SELECT, for illustration of circuit board.

DC Voltages

WARNING: While measuring the -5.2V DC power supply, ensure that utmost care is taken. A power supply could be either severely damaged or completely destroyed if it is accidentally shorted to ground.

Verify that the DC votages are correct by measuring them on the Data Rate Extender circuit board. Refer to the illustration on the following page for the proper measurement points.



If the correct voltages are not indicated, consult the factory.

Calibration

Routine calibration is not normally required except in the following situations:

a. Failed component or circuit. Consult factory for further details.

b. Failure of LED indicator(s) to light if determined to be functional; measure the outputs with an oscilloscope (Tektronix 7104 or equivalent) and verify their signal outputs according to Section 3.2, SPECIFICATIONS. (Consult factory if signal outputs are not correct.)

c. Harsh environment; typical environment is:

Temperature	32 to 95°F (0 to 35°C)
Humidity	0 to 95% RH max at 20°C, non-condensing.

Any calibrations or technical adjustments other than the situations mentioned above should not be made during the Warranty period unless otherwise authorized. Consult factory for further details. (Refer to sections 3.2 and 3.5, SPECIFICATIONS and OPERATION, respectively, for proper switch, control, level and LED indicator settings.)

7. PARTS

7.1 REPLACEABLE PARTS

This section contains a listing of all electronic components and mechanical parts subject to normal wearout or failure. In the index shown below, table 7-1 is described. The table references the replaceable parts according to Tau-Tron Part no., description and quantity required.

Table	Description	Page
7-1	ME-302 Data Rate Extender	7-3

TABLE 7-1

ME-302

Data Rate Extender

ME302 DATA RATE EXTENDER

COMPONENT ITEM NO.	DESCRIPTION	QUANTITY PER
8C00-0043	SCREW PNHD MET NC.4-40X1/4	2.000
8C00-0071	SCREW PNHD MET NC.5-40X1/4	2.000
8C00-0072	SCREW PNHD MET NC.5-40X3/8	8.000
8C00-1202	LOCKWASHER NC.4 INT TOOTH	2.000
8C00-1203	LOCKWASHER NC.5 INT TOOTH	2.000
8C00-2605	SPACER MET ML/FML 4-40 X 7/8	2.000
8C0C-9020	MODULE THUMBSCREW 8-63013	2.000
9303-0004	PIN RECEPTACLE SNAP-ON	4.000
9515-4460	ME302 FRONT PANEL ASSY	1.000
9525-4460	ME302 REAR PANEL ASSY	1.000
9535-4460	ME302 BOOST TRNSTR PANEL ASSY	1.000
9545-4447	ME302 DATA RATE EXT PCB ASSY	1.000
9555-4508	ME302 INTERCONN CABLE ASSY	3.000
9705-4528	BERTS 325 MODULE RAILS	1.000

ME302 FRONT PANEL ASSY

COMPONENT ITEM NO.	DESCRIPTION	QUANTITY PER
8000-0044	SCREW PNHD MET NO.4-40X5/16	4.000
8000-1202	LOCKWASHER NO.4 INT TOOTH	4.000
9303-0015	JACKSCREW FIXED MALE	3.000
9303-0016	JACKSCREW FIXED FEMALE	3.000
9303-0087	SOCKET BLOCK PHENOLIC 6 POS	3.000
9545-4444	ME302 DSPLY & CNTRL PCB ASSY	1.000
9555-4560	CABLE ASSY COAXIAL	4.000
9555-4561	CABLE ASSY COAXIAL	6.000
9555-4562	CABLE ASSY COAXIAL	1.000
9705-4456	ME302 FRONT PANEL FINISHED	1.000
9735-6414	SPACER MET HEX 0.531 LG	4.000

ME302 REAR PANEL ASSY

COMPONENT ITEM NO.	DESCRIPTION	QUANTITY PER
0022-2120	RES COMP 12 OHM 5P 1/4W	1.000
0022-3150	RES COMP 150 OHM 5P 1/4W	1.000
0022-3300	RES COMP 300 OHM 5P 1/4W	2.000
1014-4610	CAP CER 0.1 MFD 20P 200V	1.000
1024-5110	CAP ELEC 1 MFD 35WVDC	2.000
1024-5147	CAP ELEC 4.7 MFD 20P 35WVDC	1.000
1024-5210	CAP ELEC 10 MFD 35WVDC	2.000
2101-4001	DIODE RECTIFIER 1N4001	2.000
4200-340KS	IC LINEAR REGULATOR LM340KS	1.000
4201-320KS	IC LINEAR REGULATOR LM320KS	1.000
8000-0047	SCREW PNHD MET NO.4-40X1/2	6.000
8000-0808	SCREW SLF-TAP 6 X 1/2 TYPE B	4.000
8000-1202	LOCKWASHER NO.4 INT TOOTH	1.000
8000-1506	LUG SOLDER ANGLE NO.4	5.000
8000-6000	BUSHING INSULATING TO-3	4.000
8000-6001	WASHER INSULATING TO-3	2.000
8000-6002	SOCKET TO-3 MOUNTING	2.000
9300-0103	CONN PLUG PANEL MNT 24 PCS	1.000
9705-4448	MODULE 4IN REAR PANEL MACHINED	1.000

ME3C2 BCCST TRNSTR PANEL ASSY

COMPONENT ITEM NO.	DESCRIPTION	QUANTITY PER
0022-1510	RES COMP 5.1 OHM 5P 1/4W	1.000
0032-1100	RES COMP 1 OHM 5P 1/2W	1.000
0273-0100	RES W.W. 0.1 OHM 10P 5W	1.000
2104-A15A	DIODE RECTIFIER GEA15A	1.000
318C-3055	TRNSTR NPN POWER 2N3055	1.000
8000-0043	SCREW PNHD MET NO.4-40X1/4	3.000
8000-0047	SCREW PNHD MET NO.4-40X1/2	2.000
8000-1002	NUT HEX MET NO.4-40	2.000
8000-1202	LOCKWASHER NO.4 INT TOOTH	5.000
8000-2800	STANDOFF INSULATED LUG NO.4-40	3.000
8000-6000	BUSHING INSULATING TO-3	2.000
8000-6001	WASHER INSULATING TO-3	1.000
8000-6002	SOCKET TO-3 MOUNTING	1.000
9705-3283	BCCST TRANSISTOR PANEL	1.000

ME302 DSPLY & CNTRL PCB ASSY

COMPONENT ITEM NO.	DESCRIPTION	QUANTITY PER
0012-3330	RES COMP 330 OHM 5P 1/8W	2.000
0012-3470	RES COMP 470 OHM 5P 1/8W	3.000
0022-3200	RES COMP 200 OHM 5P 1/4W	1.000
1064-1233	CAP MIN-TANT 33 MFD 10WVDC	2.000
2101-4001	DIODE RECTIFIER 1N4001	1.000
2112-4148	DIODE GEN PURPOSE 1N4148	2.000
2274-5374	DIODE LED YELLOW MV5374C	8.000
2274-5774	DIODE LED RED MV5774C	1.000
4012-7404	IC TTL SN7404N PLSTC	1.000
8000-0047	SCREW PNHD MET MC.4-40X1/2	2.000
8000-1302	FLAT WASHER MET NC.4	2.000
8000-2903	SPACER NYLON 3/16OD X 7/16LG	9.000
9201-0002	SWITCH SLIDE DPDT VSS2250	1.000
9205-0011	SWITCH PB MAINTAINED LTD YEL	2.000
9313-0008	CONN EDGE DUAL 22 POS NO EARS	1.000
9545-4501	ME302 LED PCB ASSY	1.000
9605-4443	ME302 DSPLY & CNTRL PCB	1.000

ME302 DATA RATE EXT PCB ASSY

COMPONENT ITEM NO.	DESCRIPTION	QUANTITY PER
0012-2180	RES COMP 18 OHM 5P 1/8W	2.000
0012-2510	RES COMP 51 OHM 5P 1/8W	24.000
0012-2750	RES COMP 75 OHM 5P 1/8W	38.000
0012-3100	RES COMP 100 OHM 5P 1/8W	4.000
0012-3120	RES COMP 120 OHM 5P 1/8W	7.000
0012-3150	RES COMP 150 OHM 5P 1/8W	2.000
0012-3270	RES COMP 270 OHM 5P 1/8W	1.000
0012-3300	RES COMP 300 OHM 5P 1/8W	2.000
0012-3470	RES COMP 470 OHM 5P 1/8W	17.000
0012-4100	RES COMP 1 KOHM 5P 1/8W	1.000
0012-4130	RES COMP 1.3 KOHM 5P 1/8W	5.000
0012-4390	RES COMP 3.9 KOHM 5P 1/8W	5.000
0022-2100	RES COMP 10 OHM 5P 1/4W	5.000
0022-2150	RES COMP 15 OHM 5P 1/4W	1.000
0333-3100	RES VAR 100 OHM 10P 1/2W	1.000
0333-3500J	RES VAR 500 OHM 10P 1/2W	2.000
0333-4100G	RES VAR 1 KOHM 10P 1/2W	2.000
0333-4100T	RES VAR 1 KOHM 10P 1/2W	11.000
1024-5110	CAP ELEC 1 MFD 35WVDC	6.000
1064-1233	CAP MIN-TANT 33 MFD 10WVDC	2.000
1064-4210	CAP MIN-TANT 10 MFD 25WVDC	7.000
1084-4710	CAP CHIP .01 MFD 50WVDC	71.000
2101-4001	DIODE RECTIFIER 1N4001	2.000
2112-4148	DIODE GEN PURPOSE 1N4148	2.000
4012-10102	IC ECL MC10102P PLSTC	1.000
4012-10105	IC ECL MC10105P PLSTC	1.000
4012-10124	IC ECL MC10124P PLSTC	1.000
4012-10158	IC ECL MC10158P PLSTC	1.000
4012-10172	IC ECL MC10172P PLSTC	1.000
4012-11C01F	IC ECL F11C01FC CER	2.000
4012-11C06	IC ECL F11C06DC CER	3.000
4012-1692L	IC ECL MC1692L CER	1.000
4055-0102	IC ECL F100102FC	3.000
4055-0107	IC ECL F100107FC	1.000
4055-0114	IC ECL F100114FC	1.000
4055-0151	IC ECL F100151FC	2.000
4176-1033	AMPLIFIER FREQ 1 GHZ UTC-1033	1.000
4200-340T15	IC LINEAR REGULATOR LM340T15	1.000
4200-340T5	IC LINEAR REGULATOR LM340T5	1.000
4201-337T	IC LINEAR REGULATOR LM337T	1.000
4670-0001	POWER SPLITTER ANZAC CS-313	1.000
7000-0003	RELAY DPDT TC-5 8 PIN JMAW-5L	1.000
8000-0044	SCREW PNHD MET NO.4-40X5/16	4.000
8000-0523	SCREW PNHD NYLON NO.6-32X3/8	2.000
8000-1101	NUT HEX NYLON NO.6-32	2.000
8000-1202	LOCKWASHER NO.4 INT TOOTH	4.000
8000-1204	LOCKWASHER NO.6 INT TOOTH	2.000
8000-1302	FLAT WASHER MET NO.4	4.000

ME302 DATA RATE EXT PCB ASSY

COMPONENT ITEM NO.	DESCRIPTION	QUANTITY PER
8000-1412	FLAT WASHER NYLON NO.6	2.000
8000-1422	WASHER MICA NO.6	1.000
9100-0117	HEAT SINK TO-3 PREDRILLED	1.000
9201-0002	SWITCH SLIDE DPDT MSS2250	2.000
9201-0013	SWITCH SLIDE 4PDT MSS4250	2.000
9207-0003	SWITCH DIP SPST 4 SECTIONS	1.000
9301-0060A	CONN COAXIAL PCB MNT	11.000
9303-0003	CONN POST MALE	4.000
9306-0004	SOCKET PIN LOW PROFILE	110.000
9565-9083	MASSOM MCKT ASSY	6.000
9565-9171	M302 MCKT ASSY	1.000
9565-9178	DATA SAMPLER MCKT ASSY	1.000
9605-4446	ME302 DATA RATE EXT PCB	1.000

ME302 LED PCB ASSY

COMPONENT ITEM NO.	DESCRIPTION	QUANTITY PER
3616-0100	PHOTOCELL FAIRCHILD FPT-100	3.000
9605-4500	ME302 LED PCB	1.000
9725-4458	PHOTOCELL MOUNTING BLOCK	1.000

8. DIAGRAMS

8.1 GENERAL

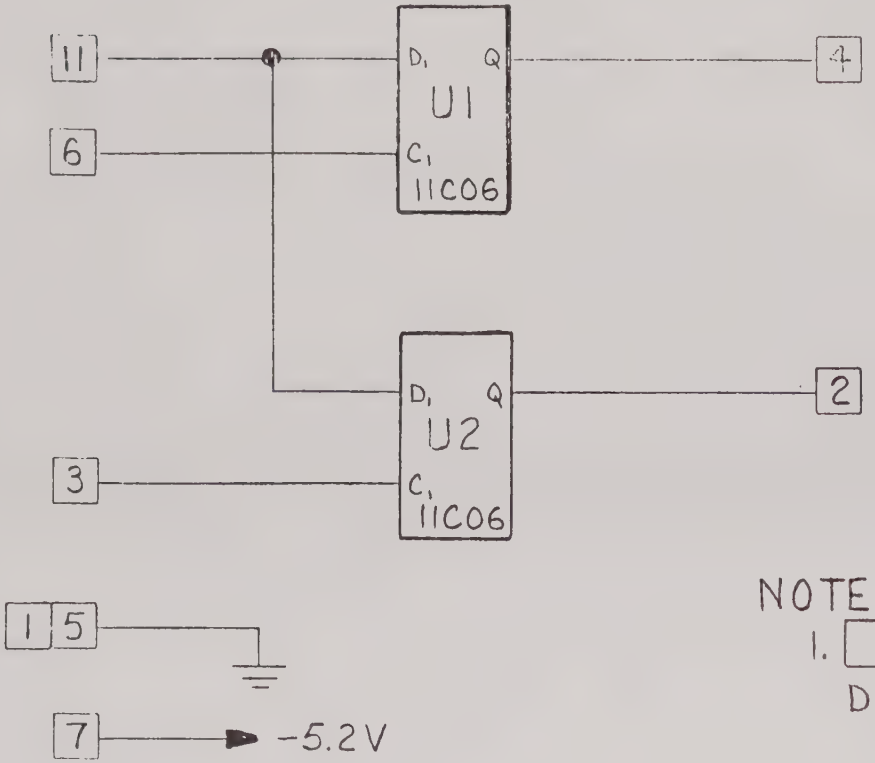
This section contains Block and Schematic diagrams for the ME-302 module. Figures are given in the table below.

TABLE 8-1

DIAGRAMS

Figure	Description
8-1	ME-302 Data Sampler Schematic
8-2	ME-302 Data Rate Extender Card Schematic
8-3	ME-302 Display and Control Card Schematic
8-4	ME-302 LED PCB Schematic
8-5	ME-302 Power Supply Schematic

ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	RELEASED TO MFG.	9-12-81	BAC



NOTES:
1. ☐ DENOTES PIN OF 14 PIN DIP PACKAGE.

WHERE APPLICABLE: REMOVE ALL BURRS & BREAK SHARP EDGES TO 1/64.	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: ANGLES ± FRACTIONS ± 3 PLACE DECIMALS ± 2 PLACE DECIMALS ± 1 PLACE DECIMALS ±
MATERIAL:	
NEXT ASSY: 1176 / USED ON: ME-302	
APPLICATION	

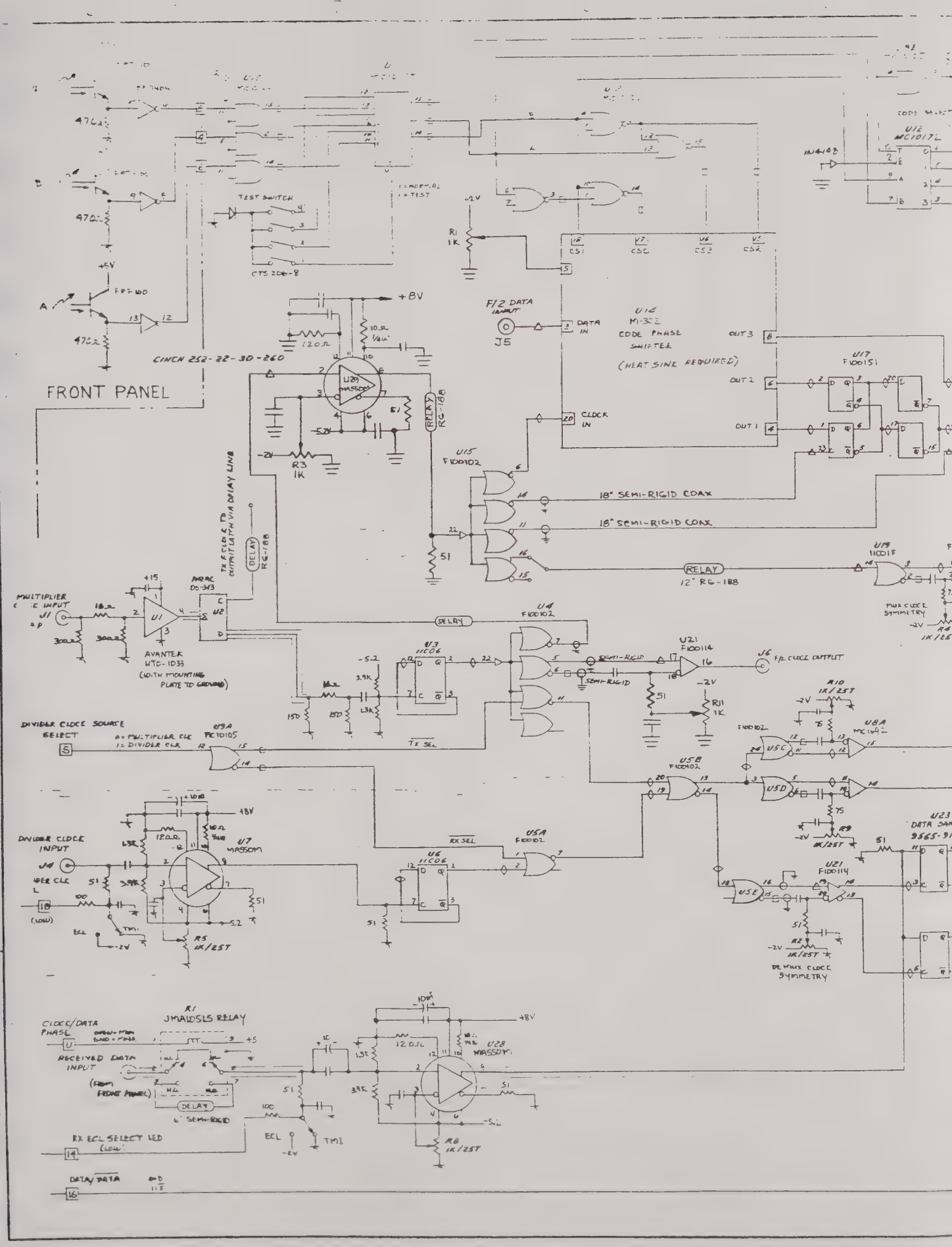
CONTR NO.		
DR C. Lacritz	12-17-80	
CHK	12-17-80	
APPD	12-17-80	
APPROVED		
BY DIRECTION OF		

tau-tron inc

DRAWING TITLE: SCHEMATIC, DATA SAMPLER — Fig. 8-1, 1 of 1

SIZE	CODE IDENT NO.	DRAWING NO.	REV
A		TAJ-59177	A

SCALE — | ME-302 | SHEET 1 OF 1


FRONT PANEL
CINCH 252-22-30-260
TEST SWITCH
CTS 206-8
+5V
+8V
-2V
-5.2
F/2 DATA INPUT
J5
DATA IN
CLOCK IN
U16
M-352
CODE PHASE SHIFTER
(HEAT SINK REQUIRED)
OUT 3
OUT 2
OUT 1
U17
F100151
18" SEMI-RIGID COAX
18" SEMI-RIGID COAX
RELAY
12" RG-188
U19
11C01F
MUX CLOCK SYMMETRY
U15
F100102
S1
R3
1K
RELAY
RG-188
DELAY
RG-188
TX F CLOCK TO OUTPUT LATCH VIA DELAY LINE
MULTIPLIER I.C. INPUT
J1
AVANTEK
UTO-1033
(WITH MOUNTING PLATE TO GROUND)
ANALOG DEVICES
DG-303
U1
U2
U4
F100102
U3
11C06
U21
F100114
J6
F/L CLOCK OUTPUT
SEMI-RIGID
SEMI-RIGID
DELAY
TX SEL
DIVIDER CLOCK SOURCE SELECT
0 = MULTIPLIER CLK
1 = DIVIDER CLK
U9A
MC10105
DIVIDER CLOCK INPUT
J4
U7
MASSOM
RX SEL
U6
11C06
U5A
F100102
U5B
F100102
U5C
F100102
U5D
F100102
U5E
F100102
U8A
MC1648
R10
1K/25T
R9
1K/25T
R8
1K/25T
DIVIDER CLOCK SYMMETRY
U23
DATA SAM
9565-91
R1
JMAIDSLS RELAY
CLOCK/DATA PHASE
RECEIVED DATA INPUT
(FROM FRONT PANEL)
DELAY
SEMI-RIGID
U28
MASSOM
R6
1K/25T
RX ECL SELECT LED (LOW)
DATA/DATA

NOTES:

1. ALL RESISTORS 1/8W 5% CARBON UNLESS NOTED
2. MASSDM: GROUND PINS 1, 5, 9.
3. MASSDM REQUIRE HEAT SINKS
4. CASE OF JMAWS1S RELAY MUST SOLDER TO GROUND PLANE.
5. M-302 REQUIRES HEAT SINK
6. AVANTEK UTO-1033 REQUIRES MOUNTING PLATE CONNECTED TO GROUND.
7. 1K/25T POTENTIOMETERS MUST BE ADJUSTED FROM THE TOP OF THE PC BOARD.

8. = CARD EDGE CONNECTOR
9.
10. = MINIATURE PC COAX JACK - 9301-0060A
11. = 470Ω TO -5.2V
12. = 75Ω TO -2.0V
13. = 51Ω TO -2.0V
14. = 50Ω PC MICRO-STRIP RUN
15. ALL LINES TERMINATED ⊣ MUST BE 75Ω MICRO-STRIP
16. ALL LINES TERMINATED ⊣ OR 51Ω TO GROUND MUST BE 50Ω MKRO-STRIP RUN OR 50Ω SEMI-RIGID COAX.
17. RESISTORS MARKED ✱ TO BE DETERMINED IN TEST
18. ALL CAPACITORS .01μF CHIPS (1DBH-4710) UNLESS NOTED.

KY. .01μF CHIP CAPACITORS TO GROUND FROM VEE PIN OF EACH IC.

WHERE APPLICABLE REMOVE ALL BURRS & BREAK SHARP EDGES TO 1/64	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: ANGLES ± FRACTIONS ± 3 PLACE DECIMALS ± 2 PLACE DECIMALS ± 1 PLACE DECIMALS ± MATERIAL.	CONTR NO DR [illegible] 10/1/80 CHK B. Cooper 5/19/81 APPD APPROVED BY DIRECTION OF

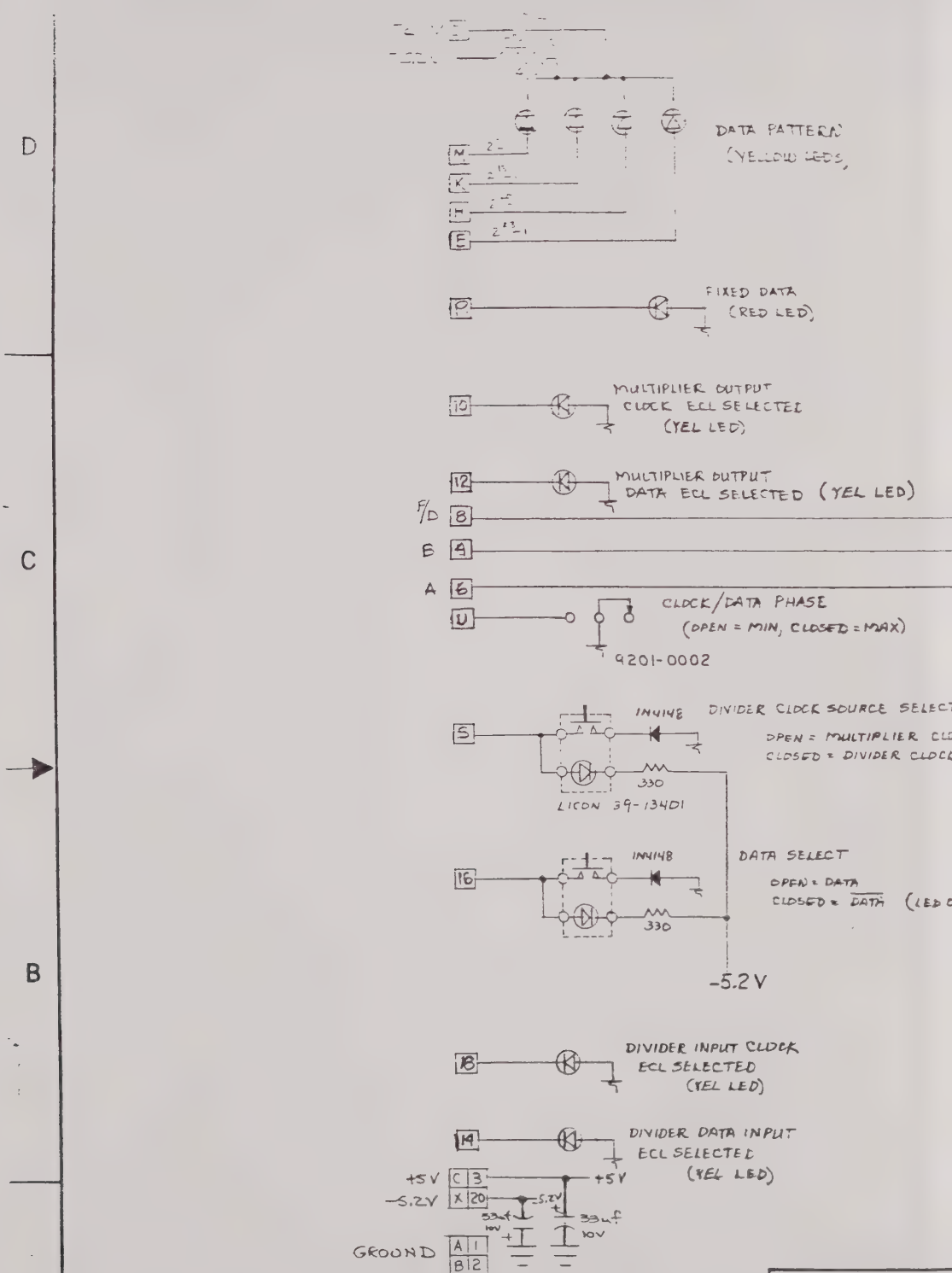
NEXT ASSY: ME-302	USED ON	
APPLICATION		

tau-tron inc

DRAWING TITLE
SCHEMATIC
DATA RATE EXTENDER CARD
Fig. 8-2
1 of 1

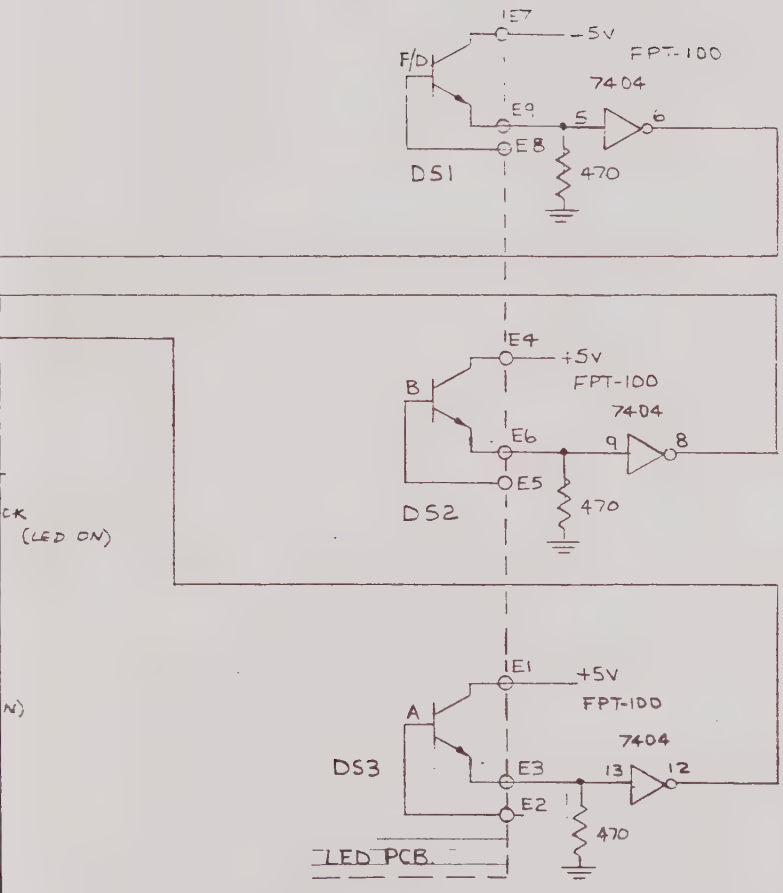
SIZE	CODE IDENT NO.	DRAWING NO.	REV
D		TDJ-54445	C

SCALE — SHEET 1 OF 1



WHERE APPLICABLE
REMOVE ALL BURRS
SHARP EDGES TO 1/

TDK-54444	ME
NEXT ASSY	U
APPLICATIO	



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE VALUES ARE IN OHMS, 1/8 W, ± 5 %.
   b) CAPACITANCE VALUES ARE IN MICROFARADS.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	CONTR NO.	tau-tron inc	
TOLERANCES: ANGLES ±	DR P.P. Gendron 10/22/80		
FRACTIONS ±	CHK E. Cooper 2-24-81	DRAWING TITLE	
3 PLACE DECIMALS ±	APPD P.P. Gendron 2-24-81	DISPLAY AND CONTROL BOARD, SCH.	
2 PLACE DECIMALS ±			
1 PLACE DECIMALS ±			
MATERIAL:	APPROVED	SIZE: C	CODE IDENT NO.:	DRAWING NO.: TCJ-54442	REV: B
	BY DIRECTION OF	SCALE:	ME-302	SHEET 1 OF 1	

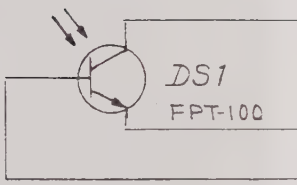
Fig. 8-3
1 of 1

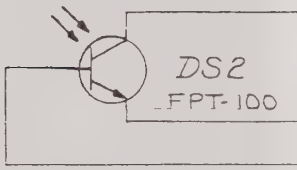
D

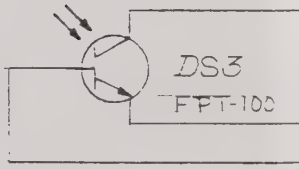
C

B

A



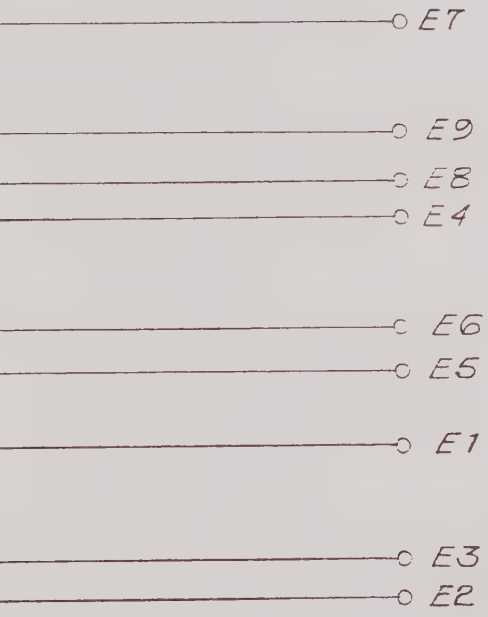




WHERE APPLICABL
REMOVE ALL BURR
SHARP EDGES TO

TCK-54501	
NEXT ASSY	
APPLICAT	

03-0063 (8/71) .003 MYLAR



D

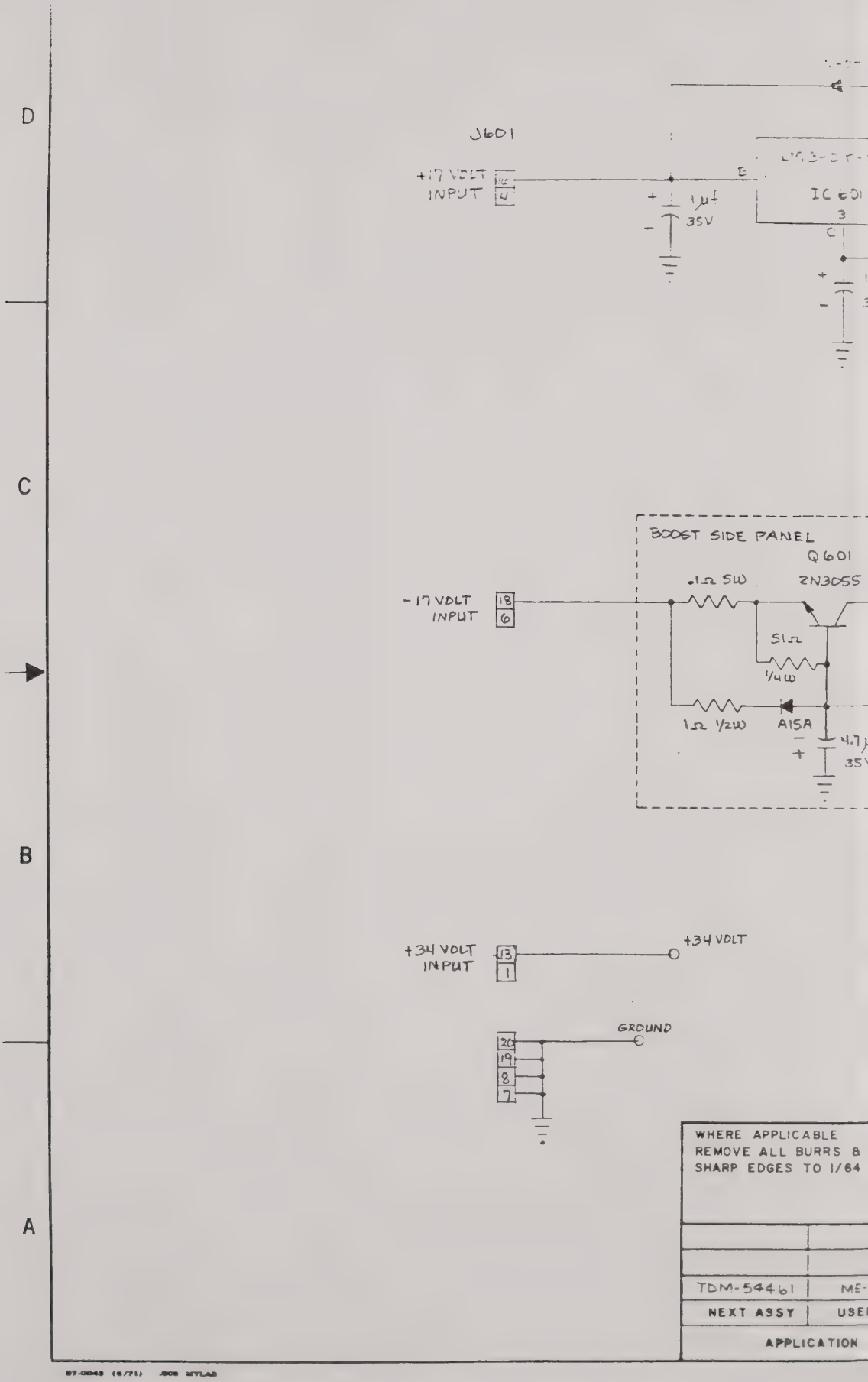
C

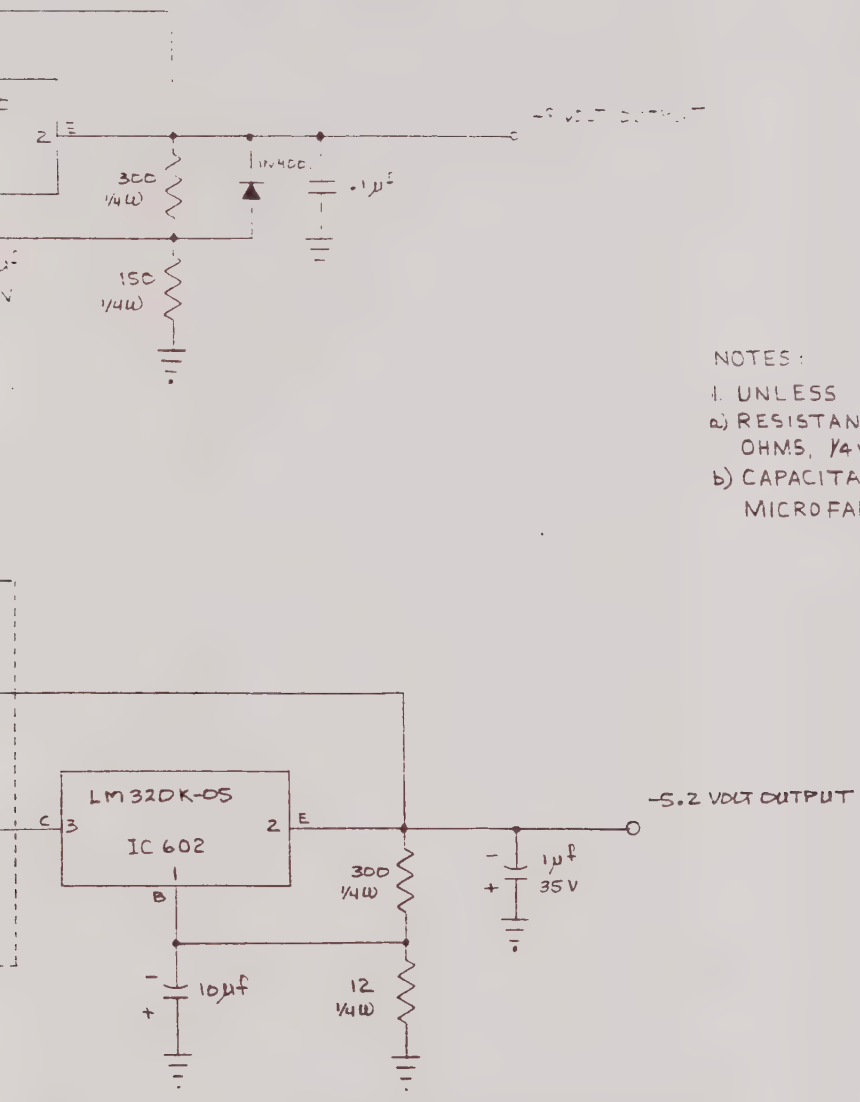
B

A

5 & BREAK /64	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	CONTR NO.	tau-tron inc
	TOLERANCES. ANGLES ±	DR [illegible]	12 Nov 71
	FRACTIONS ±	CHK B. Cotton	5/19/72
	3 PLACE DECIMALS ±	APPD P.E. Hardin	5-18-51
	2 PLACE DECIMALS ±		
	1 PLACE DECIMALS ±		
ME-302	MATERIAL:	APPROVED	DRAWING TITLE: SCHEMATIC, LED PCB
USED ON		BY DIRECTION OF	SIZE: C | CODE IDENT NO. | DRAWING NO.: TCJ-54499 | REV: A'
TION			SCALE: — | ME-302 | SHEET 1 OF 1

Fig. 8-
1 of 1


D
C
B
A
J601
+17 VOLT INPUT
1µf
35V
IC 601
BOOST SIDE PANEL
Q601
2N3055
.1Ω 5W
-17 VOLT INPUT
18
6
51Ω
1/4W
1Ω 1/2W
A15A
4.7µ
35V
+34 VOLT INPUT
13
1
+34 VOLT
GROUND
20
19
8
7
WHERE APPLICABLE
REMOVE ALL BURRS &
SHARP EDGES TO 1/64
TDM-54461
NEXT ASSY
APPLICATION



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE VALUES ARE IN OHMS, 1/4W, ± 5%.
   b) CAPACITANCE VALUES ARE IN MICROFARADS.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: ANGLES ± FRACTIONS ± 3 PLACE DECIMALS ± 2 PLACE DECIMALS ± 1 PLACE DECIMALS ±	CONTR NO.		tau-tron inc	
MATERIAL:	DR PRJ	2-18-81	DRAWING TITLE ME-302 POWER SUPPLY SCHEMATIC	
	CHK BC	2-19-81		
	APPD PRJ	2-19-81		
APPROVED			SIZE: C	CODE IDENT NO.
BY DIRECTION OF			DRAWING NO.: TCX-54463	REV: A
			SCALE	ME-302 SHEET 1 OF

Fig. 8-5
1 of 1

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Company _____ Dept./MS _____

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State & Zip _____ Phone _____

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IN THE
UNITED STATES

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POSTAGE WILL BE PAID BY ADDRESSEE

ATTN: Sales Department

Tau-tron Inc.

10 Lyberty Way
Westford, MA. 01886

Repair Returns

To return a unit for repair:

1. Call the Customer Service Dept. **(617) 692-5100** or **1-800-TAU-TRON (outside MA),** for a **Repair Authorization Number.** This will reduce administrative delays and ensure prompt return of your unit.
2. Complete and **attach one of the Repair Tags** below to your unit.
3. **Pack the unit** in the original shipping carton and packaging materials, if available. Otherwise use a double-walled carton (test strength of 350 lb) and shock absorbing material such as bubble wrap to prevent the unit from moving in the carton during transit. Seal with heavy paper tape.
4. **Send to:**

   Tau-tron
   10 Lyberty Way
   Westford, MA 01886
   attn: Customer Service

Repair Tag

Repair Authorization Number _____

Model _____ **Serial Number** _____

☐ Warranty repair ☐ Dead on arrival ☐ Repair ☐ Modification ☐ Recalibration

Symptoms: _____

_____

Name _____ Title _____

Company _____ Dept./MS _____

Address _____ City _____

State&Zip _____ Phone _____

Form 0163-1181A

Repair Tag

Repair Authorization Number _____

Model _____ **Serial Number** _____

☐ Warranty repair ☐ Dead on arrival ☐ Repair ☐ Modification ☐ Recalibration

Symptoms: _____

_____

Name _____ Title _____

Company _____ Dept./MS _____

Address _____ City _____

State&Zip _____ Phone _____

Form 0163-1181A

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